April 27, 2007

FINDINGS

ON THE EXAMINATION OF UPGRADES TO THE ELECTION SYSTEMS AND SOFTWARE OPTICAL SCAN VOTING SYSTEM

April 4 and 5, 2007, the Office of the Idaho Secretary of State, Ben Ysursa, conducted certification hearings in Boise, Idaho, to review the latest upgrades to the Election Systems and Software Optical Scan voting system and the AutoMARK ballot marking device pursuant to section 34-2409 of the Election Laws of the State of Idaho.

The system presented by the vendor is federally certified.

The hearings were conducted by staff including Secretary of State Ben Ysursa, Chief Deputy Tim Hurst, HAVA Coordinator Jim Mairs and Election Supervisor Marilyn Johnson. Senator Stan Bastian (R), Representatives Phylis King (D), Ken Roberts (R) and Bert Stevenson (R) also attended.

Consultants Dr. Rob Anson, Computer Science Department at Boise State University and Al Davidson, President of Election Management Solutions provided additional expertise.

Members of the state HAVA planning committee attended as did representatives from several counties and businesses, members of the access community and other interested citizens.

Representatives from ES&S included Lori Collins, state certification manager, Katie Tate, regional account manager, Kevin Kerrigan, international certification manager and Adam Krajicek, technical support.

Equipment and Software reviewed for Certification

Unity 3.0.1.1 with AutoMARK 1.1

ES&S Unity 3.0.1.1.
NASED number: N-2-02-22-22-006 (2002), August 31, 2006
ES&S AutoMark Voting System Release 1.1.2258
NASED number: N-2-16-22-22-002(2002), August 31, 2006

Unity Software:

Election Data Manager, (EDM) version 7.4.4.0.
ES&S Image Manager, (ESSIM) version 7.4.2.0.
Hardware Programming Manager, (HPM) version 5.2.4.0.
Data Acquisition Manager (DAM), version 6.0.0.0.
Election Reporting Manager (ERM), version 7.1.2.1.
Audit Manager, version 7.3.0.0.

Firmware:

M100 version 5.2.1.0. Precinct optical scan tabulator
M650 version 2.1.0.0. Central count optical scan tabulator

AutoMark/AIMS software:

AutoMark Information Management System, (AIMS) version 1.2.18.
AutoMark Voter Assist Terminal, (VAT) version 1.1.2258

The system with the above components is currently certified in Florida, Iowa, Michigan, New Mexico, Ohio, Oregon and West Virginia.

Required Procedures for Certification

Pre-election Testing by County of the M100
Pre-election Testing by County and Calibration of the M650
Pre-election Testing by County of the AutoMARK
Election Day Testing of the M100
Election Day Testing and Calibration of the M650
Election Day testing at the polls by poll workers of the AutoMARK
Over Mark procedure with highlighter
Ballot folding procedure for absentee ballots

All procedures were evaluated.

Required Tests

M100 and M650 Logic and Accuracy
M100 and M650 Ballot Marking Device Test
M100 and M650 Indeterminate Read Marks and Over Mark Procedure
M100 and M650 Ballot condition and Ballot Folding Procedure
M650 Load/Stress test
AutoMARK upgrade to 1.1.2258 - Oval ballots
AutoMARK upgrade to 1.1.2258 - Arrow ballots
"Pick your Party" coding and ballot layout options for one page Primary ballot for the AutoMARK

All required tests were performed.

Required Documentation from the vendor

M100 Election Day checklist
M100 Pre-election checklist
M650 Calibration Procedure
M650 Pre-election Day checklist
M650 Election Day checklist
AutoMark Pre-election Day checklist
AutoMark Election Day checklist
AutoMark poll worker checklist

Vendor provided all documentation.

Description of ES&S Optical Scan Voting System

The **ES&S M650 2.1** is a central count optical scan tabulator that utilizes paper optical scan ballots marked by filling in an oval to indicate the voter's choices. Mark detection capabilities have been improved on the M650 with the latest upgrades. The primary modification was a change to the type of light source that is used to illuminate the ballot during scanning. The new sensors in the M650 employ a green light. This new light source provides an improved response to various types of marking devices including ballpoint pen inks and pencils. The system also improves scanner performance and reduces errors that may be caused by voter hesitation marks on a ballot, folds, dirt smudges and other ballot anomalies. Totals are saved on a zip disk which is removed from the unit and inserted in a reader for import into a laptop computer where results are combined and reported utilizing the Unity Data Acquisition Manager (DAM), and the Election Reporting Manager (ERM).

The **ES&S M100 5.2.1.0** is a precinct based optical scan tabulator that utilizes paper optical scan ballots marked by filling in an oval to indicate the voter's choices. The voter is immediately notified by an electronic sound that they have over voted or under voted thus providing an opportunity to review and correct their ballot before tabulation. Precinct tabulation is accomplished by the M100 and saved on three redundant PCMCI memory cards. One card is transported to the county counting center and precinct totals are combined with other precincts utilizing the Unity Data Acquisition Manager (DAM), and reported through the Election Reporting Manager (ERM).

The **AutoMARK 1.1** voter assist terminal is a ballot marking device, no votes are stored in the machine. The marking device is used to meet the accessibility requirements of the Help America Vote Act for the blind and visually impaired. The voter uses a touch screen or Braille keypad with an audio ballot to indicate their choices. A review screen provides the voter an opportunity to review their ballot before the ballot is marked. The AutoMARK utilizes optical scan ballots identical to ballots used in counties using optical scan paper based systems. AutoMARK ballots may be tabulated on any optical scan tabulator certified for use in the State of Idaho. AutoMARK ballots are hand counted in counties using paper ballots. Counties that use punch card ballots also count AutoMARK ballots by hand and add totals into their accumulation and results programs. The firmware upgrade included in this version of the AutoMARK relaxes scanner tolerances to minimize "print on one side" errors and improve scanner recognition if the ballot is skewed when inserted into the device.

Unity 3.0.1.1 is a suite of software products that integrates an election data base program (Election Data Manager, EDM), a graphics program for ballot design (ES&S Image Manager, ESSIM), an election coding program (Hardware Programming Manager, HPM), a program for accumulation (Data Acquisition Manger, DAM), a reporting program (Election Reporting Manager ERM), an audit program (Audit Manager), and a program that produces machine coding and audio ballot coding for the AutoMARK, (AutoMARK Information Management System AIMS). There were no upgrades to **Unity On-Line**, a limited on-line version of this suite of products.

Equipment Test Results

M650 v. 2.1 Logic and Accuracy test

The M650 tabulated and correctly reported results from test decks of the multiple ballot styles used in Idaho including a one page primary ballot, a two page primary ballot, a one page general election ballot and a two page general election ballot. Cross over votes, under votes and overvotes were reported correctly.

M650 v. 2.1 Ballot Marking Device Test

The M650 tabulator was tested with ES&S recommended marking devices as follows: VL Ballot pen #6100, Alternate precinct device felt tip #00505, Precinct pencil #PS-PP, Absentee pen #00500, and Absentee pencil #00540. The tabulator read all marks correctly.

The tabulator was tested with a Number 2 pencil, a Bic round point black pen, a blue pen, black felt tip pen and a random pen. The M650 read all marks correctly. The test was repeated several times to verify results.

M650 v. 2.1 Indeterminate Read Mark and Over Mark Test

The tabulator read all properly marked ballots and ballots marked darkly with checks and "Xs". The tabulator did not read circles around the oval except when the line of the circle crossed into the oval.

The tabulator read over marks that were performed with a transparent red highlighter. The tabulator did not read over marks performed with a transparent blue highlighter.

M650 v. 2.1 Ballot Condition and Folding Test

Pristine folded ballots ran through the tabulator with no problems after ballots were carefully back folded, flattened and fanned several times by ES&S staff. Actual absentee ballots will not be in pristine condition and will increase machine stops for ballot examination.

The over marking of improperly folded ballots, ballots folded through the code channel or through a marked oval was discussed. Ballots that are not folded properly will increase machine stops for inspection. Ballots folded through the code channel or through a marked oval will require duplication or over marking.

M650 v. 2.1 Load/Stress Test

A test deck of one thousand pristine and properly marked ballot was run through the tabulator. The operation took about 25 minutes. The tabulator results matched the predetermined results.

This test is not intend to predict actual throughput as actual ballots, especially absentee ballots, will have marking, folding and other issues that will cause the machine to stop for ballot inspection and possible duplication by election officials.

Throughput will be considerably slower with actual election ballots.

The consultants recommended four to six thousand ballots be run as part of the on-site acceptance testing after purchase of the equipment by the counties before using the M650 in an election.

M100 5.2.1.0 Logic and Accuracy test

The M100 tabulated and correctly reported results from test decks of the multiple ballot styles used in Idaho including on a one page primary ballot, a two page primary ballot, a one page general election ballot and a two page general election ballot. The device warned of under votes and overvotes and returned the ballot to the voter for inspection before tabulation.

M100 5.2.1.0 Ballot Marking Device Test

The M100 tabulator was tested with ES&S recommended marking devices as follows: VL Ballot pen #6100, Alternate precinct device felt tip #00505, Precinct pencil #PS-PP, Absentee pen #00500, and Absentee pencil #00540. The tabulator read all marks correctly.

The tabulator was also tested with a Number 2 pencil, a Bic round point black pen, a blue pen, black felt tip pen and a random pen. The M100 read all marks correctly.

M100 5.2.1.0 Indeterminate Read Mark

The tabulator read all properly marked ballots and ballots marked darkly with “Xs”. The tabulator did not read “checks”. The tabulator did not read circles around the oval except when the line of the circle crossed into the oval.

M100 5.2.1.0 Ballot Condition and Folding Test

Pristine folded ballots successfully ran through the tabulator after ballots were carefully back folded, flattened and fanned several times by ES&S staff. See above discussion on folded ballots and the M650. Actual ballots may require inspection and duplication if the M100 is used in a central count setting to tabulate absentee ballots.

AutoMARK upgrade to 1.1.2258 - Oval ballots

Three AutoMARK machines were selected from Ada County for upgrade. The machines selected displayed "print on one side" errors and "ballot recognition" errors with the Ada County general election ballot used for the test. During the selection process one machine produced 4 errors in 10 two page ballots, (20 pages).

The upgrade was uploaded into the three selected units via flash card by the ES&S technician. The process took about 15 minutes. The technician estimated that in the field the upgrade would require 20 -30 minutes per machine if ES&S staff had sufficient room to work and the machines were efficiently staged to allow 6 machines to be serviced in sequence.

The upgrade was tested with 10 two page ballots in each machine, (60 pages). The "print on one side" error did occur once in one machine and did not occur in the other machines. An error message appeared giving notice to the voter that there was a problem in the ballot marking process and to request assistance.

As pointed out by the consultants, although greatly improved, the error rate of 1 page out of 60, or 1.67%, would affect 1 voter in 30 for a vote error occurrence rate of 3.4% of the ballots cast in the upgraded devices. The machines used for testing were serviced on-site immediately before the test. This rate could possibly affect 32 machines of the current 932 in the state in machines that will be transported to the polls after they are serviced.

The "ballot recognition" error did not occur in the upgraded AutoMARKs which indicated that the upgrade adjustments to scanner tolerances for ballots with print variations were successful. Skewed ballots were ejected and the voter was notified on the screen before the printing process began precluding possible ballot recognition errors.

AutoMARK upgrade to 1.1.2258 - Arrow ballots

The upgrade was performed on the arrow ballot AutoMARK units from Twin Falls County as above. The arrow ballot machines also performed without error.

During the discussion of arrow ballot machines it was noted by ES&S that print calibration can not be accomplished using the "enable calibration suggestions" setting on the test ballot print screen. Calibration of arrow ballot AutoMARK machines must be done by a technician during the preventative maintenance of the units.

"Pick your Party" coding and ballot layout options for one page Primary ballot for the AutoMARK

The "pick your party" option on a one page primary election ballot was demonstrated successfully. The first screen on the unit, and on the audio ballot, offered the voter a choice of Democratic ballot, Republican ballot or non-partisan judicial ballot. When the

voter made their choice, the next screen took them to the first race of the party ballot, or non-partisan ballot, they had selected.

Comments and Recommendations

The M650 2.1

Calibration

The ES&S technician demonstrated the calibration procedure for the M650 before testing. Documentation provided specified the recommended sensitivity settings for the optical scanners. Emails from the vendor state: "The units are also federally certified for accuracy at this sensitivity" and "they cannot change without technician intervention" and setting adjustments are not intended "to be made by anyone other than a technician".

California and Oregon have also required the vendor to provide these same calibration procedures for certification of the M650 2.1. Some counties there do make adjustments with an ES&S technician on the phone.

The vendor affirmed the following as correct: "Calibration needs to be verified and/or performed twice; once during regular preventative maintenance where scanners are calibrated to the prescribed range by a technician using ballots from the last election (if available). If past election ballots are not available a test deck of "Shade" ballots from ES&S is utilized. The calibration of the M650 must be tested and set to read actual election ballots during logic and accuracy tests as black levels may vary between test ballots and actual election ballots printed by different printers. This procedure is performed by an ES&S technician on site or by phone."

- All M650 tabulators are to be calibrated by the vendor during the preventive maintenance cycle with ballots from a past election if available as black levels will be similar if the county is using the same printer.

- The M650 calibration must be checked again with actual election ballots before logic and accuracy testing to assure the scanner is reading actual ballots within the prescribed range for sensitivity as federally certified.

- Any adjustment to calibration should be made by a qualified ES&S technician and verified before tabulation begins with a "ballot image report" to be retained as prescribed by statute with ballots and other election reports.

- A second logic and accuracy test and ballot image report should be generated after tabulation to assure settings were correct during tabulation.

Sort Switch Positions and ballot Pre-Sorting Procedures

The vendor does not make any recommendations for sort switch settings or pre-sorting procedures. Procedures vary state to state and county to county from performing an intensive ballot screening for over votes, blank ballots, and write-ins before tabulation, which increases throughput, to utilizing the M650 sorting options to sort the ballots which causes the machine to stop for under votes, over votes, blank ballots and write-ins.

The vendor did say that some counties have detailed procedures and are well prepared with labeled bins to sort ballots when the machine stops and ballots require inspection.

- Counties should set the M650 to sort for only blank ballots and write-ins as these ballots require inspection.

- Before tabulation, ballot inspection for improperly marked ballots, blank ballots, and damaged ballots should be performed.

Marking Devices

Both the M650 with green light source and the M100 correctly read properly marked ballots using the ES&S recommended marking devices. Both tabulators also correctly read a #2 pencil and random ink pens.

- Counties are to provide ES&S approved marking devices or #2 pencils for marking the ballots.

Over Marking

Although they prefer over marking to duplication, ES&S does not have a standard over marking procedure. They have worked with California and Oregon to develop a procedure using a transparent highlighter that preserves voter intent and is easily read by the M650. If the correct marker is selected sensitivity settings are not a factor.

The M650 with green light source correctly read over marked ballots using a transparent red highlighter, Mr. Sketch brand. The M650 did not read ballots over marked with an Avery blue transparent marker.

- Counties are to continue to use the existing ballot duplication procedure until the state develops and approves an alternate procedure.

- If a situation develops during an election where duplication of a large number of ballots is necessary and sufficient ballot stock is not available, a county, after verifying the readability of a red transparent highlighter on their tabulators, may over mark ballots in a manner that preserves voter intent by marking a transparent vertical red line though the voted oval.

Indeterminate Read Marks

Both the M650 with green light source and the M100 correctly read properly marked ballots. Darkly marked "checks" and "Xs" were read by the M650. The M100 did not read "checks".

- Voters are to be instructed to properly mark the optical scan ballot through a voter education campaign.

- Suggested voter instructions:

  "Completely darken the oval with the marking device provided to make sure your vote can be counted by machine."

Ballot Condition and Folding

Folded absentee ballots can cause paper jams in tabulators and may stop the machine for ballot inspection. ES&S demonstrated their recommend ballot folding procedures for various length ballots. They prefer two folds as opposed to the single fold style currently used in Idaho. Several counties design their own envelopes to accommodate the larger single fold ballot and Caxton Printers has existing stock of large envelopes. In the future shape based postage and the need to pre-insert ballots into smaller envelopes may force some counties to consider two folds.

- Training and time should be allotted for staff to prepare ballots for tabulation. ES&S staff was very careful with the ballots. They made sure ballots were as flat as possible, that all ballots were fanned several times and aligned before placing a stack into the tabulator. They also did not overload the tabulator with too many ballots per run. A stack of ballots 3 to 4 inches was used.

Unity 3.0.1.1

The vendor demonstrated the Unity suite and explained the functions of the various modules. No specific tests were performed on the software as it has been federally certified. Enhancements were minor and appeared to be working correctly.

Counties could choose to purchase the entire suite and ES&S will provide one week on-site training for counties that choose this option. Counties may also continue to use Unity Online to develop their ballots as the election database is well established. Counties could also choose to fax or email their election definitions but this method would significantly slow down the ballot generation and approval phase and may incur an additional cost from ES&S.

ES&S is now "testing" the entry of statewide races as requested by the state. This feature would allow the state to enter all statewide data for all counties in a single operation thus reducing opportunities for error. It is the vendor's "hope" that statewide data entry will be available for the 2008 primary.

The reporting error that occurred in Bannock County was discussed. The operator choose the "Add" mode instead of the "Replace" mode when accumulating results which produced twice the number of possible registered voters.

- Special attention must be paid during training of county staff by ES&S on the correct use of the "Add" or "Replace" reporting feature to avoid public confusion and possible reporting of inaccurate results.

AutoMARK 1.1.2258

ES&S technicians cleaned and serviced the AutoMARK units from Ada and Twin Falls counties before testing. They reported that the machines were in good condition however the belts were very loose and could be causing print errors.

After the installation of the firmware upgrade all the AutoMARK units performed as specified with one "print on one side" error discussed above. ES&S noted that this error may have been due to the stub perforation on that particular ballot.

Procedures for pre-election calibration and Election Day calibration were checked and found to be accurate.

A unit is calibrated for printing after enabling "calibration suggestions" and performing a successful "Test Ballot Print", also referred to as an "All Fill Test". It is necessary to follow procedures from the vendor and repeat the test until all ovals are filled correctly. However is it not necessary to print a test ballot in all possible orientations as most voters insert the ballot front side up with the top of the ballot fed into the machine, or they are assisted by poll workers.

If additional minor calibration suggestions are recommended by the machine the ballot should be carefully inspected. If the ovals are filled completely on the test ballot print, the operator may choose not to accept additional minor calibration suggestions. The acceptable range for minor calibration is plus or minus 2.

- All AutoMARK units are to be upgraded to 1.1.2258 during the regularly scheduled preventative maintenance cycle before the primary election.

- Pre-election testing and calibration of units before transport to the polls is necessary to insure units are functioning properly before delivery. County personnel should follow the checklist provided by the vendor.

- Counties are to have a plan for calibration at the polls, as re-calibration may be necessary after transport, either by county personnel, a set up team or by a well trained poll worker. County personnel should follow the checklist provided by the vendor.

- All units should be set up at the polls and additional time allotted to test units before the polls open. If a unit fails to operate properly during Election Day, the unit should be turned off but left in place until a county worker, wearing identification as an election worker, can repair or replace the unit.

- Print calibration is a different procedure than Screen calibration which must be made clear during training. Both processes are necessary for the unit to properly function.

- AutoMARKs that use Arrow ballots must be calibrated by a technician during the preventative maintenance cycle. The unit's self-calibration option only applies to machines utilizing Oval style ballots.